WHAT IS CLAIMED IS:

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1. A tunable laser comprising:

a gain section for creating a light beam;

a phase section for controlling the light beam around a center frequency of the bandwidth;

a waveguide for guiding and reflecting the light beam in a cavity including a relatively low energy bandgap separate-confinement-heterostructure (SCH);

a front mirror bounding an end of the cavity; and

a back mirror bounding an opposite end of the cavity;

wherein gain for the light beam is provided by at least one of the group comprising the phase section, the front mirror and the back mirror.

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2. The laser of claim 1, wherein the gain provided by at least one of group comprising the phase section, the front mirror and the back mirror has a saturation power higher than substantially 5 mW.

3. The laser of claim 1, wherein the waveguide including the SCH is uniform across the gain and phase sections and the front and back mirrors.

4. The laser of claim 3, wherein the SCH includes centered shallow quantum wells.

5. The laser of claim 3, wherein the SCH is optimized such that the gain builds up rapidly to a level substantially equal to that required for a device threshold.

6. The laser of claim 3, wherein each of the gain and phase sections and front and back mirrors has an index that is separately adjusted by biases separately altered at each.

7. The laser of claim 6, wherein the indexes are adjusted while a net gain remains at a device threshold.

8. The laser of claim 3, wherein free-carrier absorption loss resulting from a build up of carriers in the SCH is at least partially compensated for by the gain provided by at least one of the group comprising the phase section, the front mirror and the back mirror.

9. The laser of claim 1, wherein the gain provided by the at least one of the group comprising the phase section, the front mirror and the back mirror is modified by a process selected from the group comprising selective quantum well intermixing, selective area growth and butt-joint regrowth of waveguides of different bandgaps.

10. The laser of claim 1, wherein gain is provided by more than one of the group comprising the phase section, the front mirror and the back mirror and each gain is separately modified by a process selected from the group comprising selective quantum well intermixing, selective area growth and butt-joint regrowth of waveguides of different bandgaps.

11. The laser of claim 10, wherein gain is provided by the front mirror modified by selective quantum well intermixing and gain is provided by the back mirror modified by selective quantum well intermixing wherein each intermixing produces different bandgap regions.

12. The laser of claim 10, wherein the gain section has relatively low quantum well and high SCH bandgaps.

13. The laser of claim 1, wherein the gain provided by at least one of the group comprising the phase section, the front mirror and the back mirror is applied through an electrical contact interlaced with a tuning electrical contact.

14. A method of producing a semiconductor laser, comprising the steps of:

growing a waveguide layer for guiding and reflecting the light beam including a relatively low energy bandgap separate-confinement-heterostructure (SCH) region on a substrate including a gain section for creating a light beam, a phase section for controlling the light beam around a center frequency of the bandwidth a front mirror bounding an end of the cavity and a back mirror bounding an opposite end of the cavity;

etching sampled grating grooves in the waveguide layer to form the front mirror and the back mirror; and

growing upper cladding and contact layers on the waveguide layer;

wherein gain is provided by at least one of the group comprising the phase section, the front mirror and the back mirror.

15. The method of claim 14, wherein the gain provided by at least one of group comprising the phase section, the front mirror and the back mirror has a saturation power higher than substantially 5 mW.

16. The method of claim 14, wherein the waveguide including the SCH is uniform across the gain and phase sections and the front and back mirrors.

17. The method of claim 16, wherein the SCH includes centered shallow quantum wells.

18. The method of claim 16, wherein the SCH is optimized such that the gain builds up rapidly to a level substantially equal to that required for a device threshold.

19. The method of claim 16, wherein each of the gain and phase sections and front and back mirrors has an index that is separately adjusted by biases separately altered at each.

20. The method of claim 19, wherein the indexes are adjusted while a net gain remains at a device threshold.

21. The method of claim 16, wherein free-carrier absorption loss resulting from a build up of carriers in the SCH is at least partially compensated for by the gain provided by at least one of the group comprising the phase section, the front mirror and the back mirror.

22. The method of claim 14, wherein the gain provided by the at least one of the group comprising the phase section, the front mirror and the back mirror is modified by a process selected from the group comprising selective quantum well intermixing, selective area growth and butt-joint regrowth of waveguides of different bandgaps.

23. The method of claim 14, wherein gain is provided by more than one of the group comprising the phase section, the front mirror and the back mirror and each gain is separately modified by a process selected from the group comprising selective quantum well intermixing, selective area growth and butt-joint regrowth of waveguides of different bandgaps.

24. The method of claim 23, wherein gain is provided by the front mirror modified by selective quantum well intermixing and gain is provided by the back mirror modified by selective quantum well intermixing wherein each intermixing produces different bandgap regions.

25. The method of claim 23, wherein the gain section has relatively low quantum well and high SCH bandgaps.

26. The method of claim 14, wherein the gain provided by at least one of the group comprising the phase section, the front mirror and the back mirror is applied through an electrical contact interlaced with a tuning electrical contact.

27. An article of manufacture comprising a sampled-grating distributed Bragg reflector (SGDBR) laser, the SGDBR laser comprising:

a gain section for creating a light beam;

a phase section for controlling the light beam around a center frequency of the bandwidth;

a waveguide for guiding and reflecting the light beam in a cavity including a relatively low energy bandgap separate-confinement-heterostructure (SCH);

a front mirror bounding an end of the cavity; and

a back mirror bounding an opposite end of the cavity;

wherein gain for the light beam is provided by at least one of the group comprising the phase section, the front mirror and the back mirror.

28. The article of claim 27, wherein the gain provided by at least one of group comprising the phase section, the front mirror and the back mirror has a saturation power higher than substantially 5 mW.

29. The article of claim 27, wherein the waveguide including the SCH is uniform across the gain and phase sections and the front and back mirrors.

30. The article of claim 29, wherein the SCH includes centered shallow quantum wells.

31. The article of claim 29, wherein the SCH is optimized such that the gain builds up rapidly to a level substantially equal to that required for a device threshold.

32. The article of claim 29, wherein each of the gain and phase sections and front and back mirrors has an index that is separately adjusted by biases separately altered at each.

33. The article of claim 32, wherein the indexes are adjusted while a net gain remains at a device threshold.

34. The article of claim 29, wherein free-carrier absorption loss resulting from a build up of carriers in the SCH is at least partially compensated for by the gain provided by at least one of the group comprising the phase section, the front mirror and the back mirror.

35. The article of claim 27, wherein the gain provided by the at least one of the group comprising the phase section, the front mirror and the back mirror is modified by a process selected from the group comprising selective quantum well intermixing, selective area growth and butt-joint regrowth of waveguides of different bandgaps.

36. The article of claim 27, wherein gain is provided by more than one of the group comprising the phase section, the front mirror and the back mirror and each gain is separately modified by a process selected from the group comprising selective quantum well intermixing, selective area growth and butt-joint regrowth of waveguides of different bandgaps.

37. The article of claim 36, wherein gain is provided by the front mirror modified by selective quantum well intermixing and gain is provided by the back mirror modified by selective quantum well intermixing wherein each intermixing produces different bandgap regions.

38. The article of claim 36, wherein the gain section has relatively low quantum well and high SCH bandgaps.

39. The article of claim 27, wherein the gain provided by at least one of the group comprising the phase section, the front mirror and the back mirror is applied through an electrical contact interlaced with a tuning electrical contact.